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Tuning Polyaniline Properties for Chemically Sensitive Field-Effect Transistors

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ChemFET Design and Fabrication

Chemically sensitive field-effect transistors (ChemFETs) are very small electronic devices fabricated in silicon that are designed to detect and quantify the presence of a chemical species in a given environment. The transduction mechanism is a chemical modulation of the work function (WF) of a semiconducting polymer on the gate of the FET by the analyte gas. In this work, an array of eight ChemFETs utilizing different partially selective gate materials on each unit will be constructed with standard and nonstandard microfabrication techniques. The array is designed for detecting gas phase analytes.

Polyaniline (PANI) Doping in the Solid-State

In the case of work function based sensors, selectivity may be achieved by adjusting the initial WF of the conducting polymer layer relative to the electronegativity of an analyte gas. It is shown in this work that solid-state WF adjustment of PANI may be achieved through proton doping from photogenerated acid or through charge-transfer doping. Solid-state doping has the advantage that proton / charge transfer doping is not a priori linked to PANI redox chemistry.

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